**SAMPLING AND ANALYSES PLAN FOR:**

# Mill Brook Stream Restoration Planning at Confluence with the Upper Ammonoosuc River in Stark, NH

**Operated Under:**
**Generic QAPP for Stream Morphology Data Collection**
RFA# 03285
(June 17, 2003)

2nd Draft
May 5, 2007

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Project Manager: _____
Signature/Date
Sharon Francis, CRJC

Technical Project Manager/QA Officer: _____
Signature/Date
John Field, Field Geology Services

Program Manager: _____
Signature/Date
Eric Williams, NHDES

Program Quality Assurance Coordinator: _____
Signature/Date
Jillian McCarthy, NHDES

NHDES Quality Assurance Manager: _____
Signature/Date
Vincent Perelli, NHDES

US EPA Project Manager: _____
Signature/Date
Warren Howard, US EPA Region I

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## 3- Distribution List

Table 1 lists people who will receive copies of the approved Sampling and Analyses Plan (SAP) under the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003.

**Table 1. SAP Distribution List**

| SAP Recipient Name | Project Role | Organization | Telephone number and e-mail address |
|---|---|---|---|
| John Field | Technical Project Manager | Field Geology Services | 207-491-9541 jfield@field-geology.com |
| Sharon Francis | Project Manager | Connecticut River Joint Commissions | 603-826-4800 sharonf@mvgalaxy.com |
| Eric Williams | Program Manager | NHDES, Watershed Management Bureau | 603-271-2358 ewilliams@des.state.nh.us |
| Jillian McCarthy | Program QA Coordinator | NHDES, Watershed Management Bureau | 603-271-8475 jmccarthy@des.state.nh.us |
| Vince Perelli | NHDES QA Manager | NHDES, Planning, Prevention, & Assistance Unit | 603-271-8989 vperelli@des.state.nh.us |
| Warren Howard | USEPA Project Manager | USEPA New England | 617-918-1587 Howard.Warren@epa.gov |

## 4- Project Task Organization

Figure 1 outlines the organization structure of the project personnel.

**Figure 1. Project Organizational Chart**

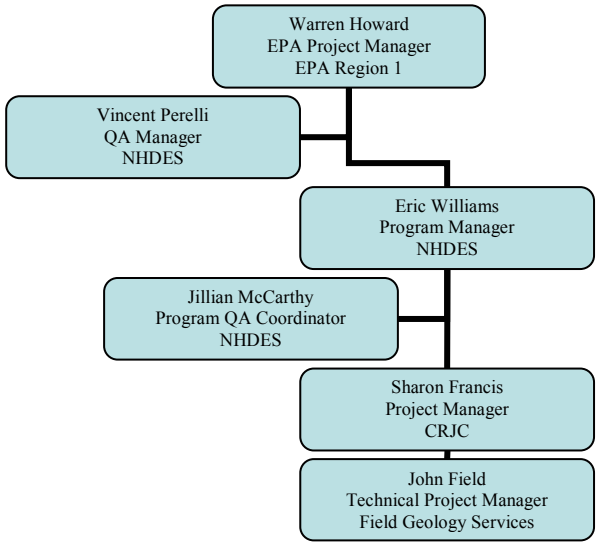


Table 2 identifies the roles and responsibilities of those individuals involved in the project.

**Table 2. Personnel Responsibilities and Qualifications**

| Name and Affiliation | Responsibilities | Qualifications |
|---|---|---|
| Sharon Francis, CRJC | Project Manager | Trained in data management and experienced project manager |
| John Field, Field Geology Services | Technical Project Manager<br>Project QA/QC Officer | Trained in stream morphology data collection, analysis, interpretation, and stream survey techniques |
| Jillian McCarthy, NHDES, Watershed Management Bureau | Reviews QAPP preparation and other QA/QC activities | On file at NHDES |
| Eric Williams, NHDES, Watershed Management Bureau | Reviews and oversees projects funded by DES 319 Restoration Grants in Connecticut, Saco, and Androscoggin watersheds. | On file at NHDES |
| Vince Perelli, NHDES Planning, Prevention & Assistance Unit | Reviews and approves QAPPs | On file at NHDES |
| Warren Howard, US EPA Region I | EPA Project Manager | On file at US EPA |

## 5-Site Information

This project will be undertaken on the lower 650 feet of Mill Brook at its confluence with the Upper Ammonoosuc River in Stark, NH (see attached site map). Eleven acres of the adjacent alluvial fan are also encompassed within the project study area, where side channels abandoned by channel straightening will potentially be reactivated. Sediment delivery from the Mill Brook watershed is high. The channel straightening at the project site and past land use practices in the upper watershed are resulting in increased sediment inputs to the Upper Ammonoosuc River. Immediately across from the confluence of Mill Brook, bank erosion threatens riparian and aquatic habitat and portions of a town road currently protected with riprap. Since the cause of erosion is the diversion of flow around excess sediment deposited at the confluence of Mill Brook, long-term success of bank stabilization efforts along the road depend on reducing these sediment inputs.

## 6-Project Rationale

### A. Problem Definition

The purpose of this project is twofold: 1) determine the amount of sediment reduction that would occur with the placement of engineered woody debris jams on the downstream end of Mill Brook and 2) develop engineering designs of woody debris jams that will increase access to abandoned side channels and lead to sediment storage on the Mill Brook alluvial fan.

The *Fluvial Geomorphology Assessment of Northern Connecticut Tributaries* completed in January 2006 identified sediment inputs from Mill Brook as a major cause of erosion along a town road on the Upper Ammonoosuc River across from the confluence with Mill Brook. The 2005 assessment report is on file at the New Hampshire Department of Environmental Services. Tributary inputs to the Upper Ammonoosuc River have been

high for several decades. The Upper Ammonoosuc River at the confluence with Mill Brook has migrated over 150 feet since the Upper Ammonoosuc River was straightened through this area in the 1800's. The excessive sediment loading has resulted in bank erosion, formation of unvegetated gravel bars, and braided flow conditions on the Upper Ammonoosuc River and Mill Brook, all factors leading to degraded aquatic habitat.

**B. Historical Data**

Previous longitudinal profile and cross section data collected for the *Fluvial Geomorphology Assessment of Northern Connecticut Tributaries* will be used as baseline data for project monitoring on Mill Brook. Cross sections on Mill Brook taken during the 2005 assessment will be combined with additional cross sections to be surveyed as part of the restoration planning on Mill Brook. The 2005 surveys were completed following the same procedures outlined in the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003. Any new surveys conducted will also follow the same procedures as those conducted in 2005. Historical aerial photographs acquired at the Natural Resources Conservation Service's Field Office in Lancaster, NH will be used to identify changes in channel position and human land use during the past 50 years on Mill Brook. Channel changes back to 1930 will be assessed using historical topographical maps available on-line at http://docs.unh.edu/nhtopos/nhtopos.htm.

## 7-Project Description and Schedule

A design for restoring abandoned side channels on Mill Brook will be completed using data from topographic maps and collected in the field following the same procedures outlined in the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003. As part of the 2005 assessment, an alternatives analysis was completed of 5 possible techniques for reducing sediment inputs into the Upper Ammonoosuc River and restoring bank stability across from the confluence with Mill Brook where large growing gravel bars are diverting flows into the bank. The option to reactivate side channels on Mill Brook was selected because of the potential to simultaneously reduce sediment inputs into the Upper Ammonoosuc River while improving aquatic habitat. Other alternatives, such as using bioengineering on the eroding banks, would provide bank protection, but would be effective only in the short term since the source of the sediment causing the problem would not be reduced. Dr. John Field completed the alternatives analysis and developed the conceptual design for reactivating the side channels on Mill Brook.

The success of the restoration will be determined by monitoring the site over a three-year period following implementation. Three cross sections will be surveyed at the site immediately following project construction and compared with cross sections taken in the same locations during the 2005 assessment. The cross sections have been monumented at both ends with half-inch diameter rebar and plotted on aerial photographs to ease relocation of the same sites. Cross sections will be surveyed following the same procedures outlined in the *Generic Quality Assurance Project Plan for Stream Morphology Data Collection* dated June 17, 2003 and on file with NH DES. This will

provide information on channel dimensions before and after project implementation. The cross sections will be resurveyed the first and second year after project implementation to determine if the amount of sediment storage on Mill Brook has increased. Ground photographs will also be taken to provide visual documentation of the project and changes that occur for a two year period after its completion. These monitoring techniques were determined to be most suitable for this type of project as they will provide both quantitative and visual evidence of changes (or lack of changes) occurring along Mill Brook after project implementation.

For the project tasks schedule, refer to the *2006 Watershed Restoration Grant Proposal for Mill Brook Stream Restoration Planning at the Confluence with the Upper Ammonoosuc River,* Sections 20 and 21 on file at NHDES. The current proposal will result in engineering designs for the proposed restoration with implementation scheduled for 2008 or 2009.

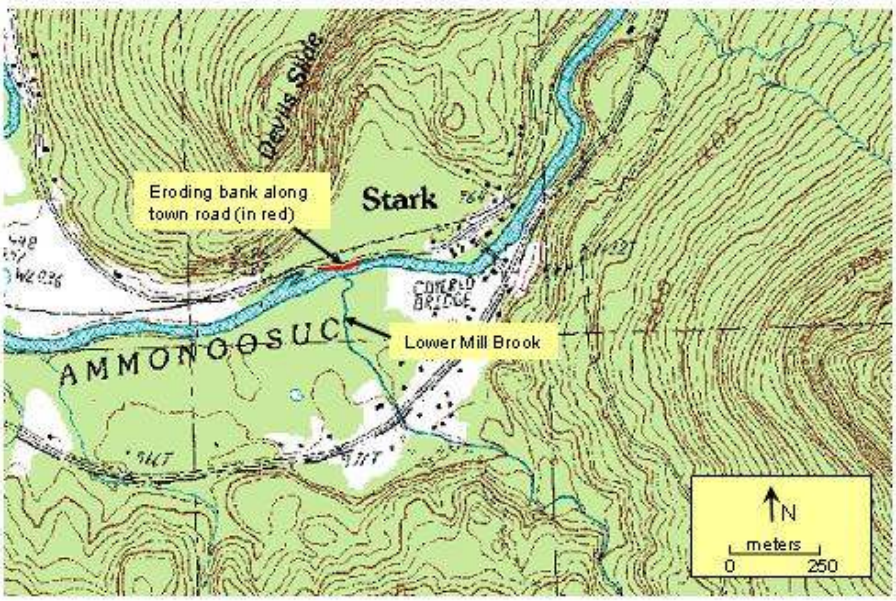
## 8-Final Products and Reporting

The final products for this project include the following:

- Survey data of existing morphological conditions on Mill Brook;
- Engineering designs for installation of large woody debris jams on Mill Brook;
- Final report with drafted cross sections, longitudinal profiles, substrate particle size analysis, and final engineering designs for Mill Brook restoration; and
- Semi-annual progress reports.

All products will be submitted by John Field, in both electronic and paper copies, to the NHDES Watershed Assistance Section for review and approval.

The final report will include a description of the environmental results and the measures of performance for this project: reductions in sediment loading; decreasing bank erosion rates; and increasing vegetation growth on bars. Reduction of sediments will ultimately result from the implementation of restoration project on Mill Brook. Although implementation will occur as part of a future project, cross-sections surveyed as part of the engineering design will be monumented for future monitoring. Ground photographs will be taken to provide the basis for "before and after" photographs to document vegetation growth on bars. The NHDES SOP for photo documentation, to be used for this project, is on file at NHDES. The cross sectional and longitudinal profile data will also be used to calculate sediment loading during a bankfull event. This data will be used to compare with sediment loading calculated after restoration is complete.


Devils Slide
Eroding bank along
town road (in red)
Stark
COVERED
BRIDGE
Lower Mill Brook
AMMONOOSUC
N
meters
0
250